SUMMARY

In these comments, U S WEST responds to the Commission's request for assistance in developing a record concerning the use, construction and evaluation of what are called proxy cost models. Proxy cost models made their debut at the Commission in the context of universal service, with various cost models being relied upon to predict the forward-looking costs of providing telephone service as a benchmark on which to base universal service support. In another context, something called the "Hatfield Model" was developed at the behest of AT&T and MCI as a device to allegedly prove what prices AT&T and MCI should be able to pay for LEC services and facilities (based on what AT&T and MCI claim are the costs of providing such services and facilities). In this proceeding, the Commission seeks comment on how to use such models and how to assure that the results are valid.

U S WEST is one of the prime sponsors of what is now known as the BCPM, a cost model which accurately predicts the forward-looking costs of providing telephone service. The BCPM model was developed as a device to determine eligibility for universal service support, but is an accurate predictor of forward-looking costs in other contexts. However, U S WEST cautions here, as it has elsewhere, that forward-looking costs are not a panacea to guide all aspects of telephone regulation and provisioning. This is especially true in the case of pricing of telephone service because a competitive market does not result in service and facilities prices being set with forward-looking costs as a cap on prices.

In contrast to the BCPM, AT&T and MCI's submission of the Hatfield Model provides a classic illustration of what a proxy cost model should not be. It was

developed with a single purpose in mind -- to drive down the price AT&T and MCI pay for services and facilities they purchase from LECs. The model is so flawed that it cannot even accurately predict AT&T's own costs and prices and, applied to AT&T's long distance service, results in forward-looking costs which are a mere fraction of what AT&T says its own forward-looking costs are. That it likewise predicts LEC forward-looking costs to be dramatically less than they really are is hardly surprising. These comments, because the latest version of Hatfield has just been released (with more than two hundred promised changes from previous versions), focus mostly on the Commission's criteria for evaluating models and the manner in which BCPM takes proper account of the criteria which would apply to any good and reliable model. Hatfield will be analyzed in the next round of comments.

As a general principle, U S WEST agrees with the criteria for model analysis set forth in the Staff Report attached to the Public Notice commencing this docket. In this regard, we demonstrate herein:

- BCPM is completely documented and easily verifiable. All model equations and logic are clearly stated and described. Underlying data is specifically documented and validated.
- BCPM allows use and modeling of all variables in the programs.
- BCPM provides an integrated module to develop structure costs.
- BCPM provides methods to process multiple investment and expense views across multiple states. BCPM properly develops capital costs.

- BCPM develops separate depreciation rates and annual charge factors for each of the USOAR Main Accounts.
- BCPM can target support to a CBG.
- BCPM is based on a network which would provide high-quality, affordable service.
- BCPM uses forward-looking technology on a realistic basis.
- BCPM provides and documents the cost of each network function.
- BCPM was designed to predict accurately forward-looking costs.

These and other benefits of BCPM are discussed herein in detail.

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
The Use Of Computer Models For Estimating Forward-Looking Economic Costs	)	CCB/CPD Docket No. 97-2
	)	

COMMENTS OF U S WEST, INC.

U S WEST, Inc. ("U S WEST") hereby submits its comments in response to the Federal Communications Commission's ("Commission") Public Notice of January 9, 1997.[1] In the Notice, the Commission requested comments on a staff analysis of computer proxy models as a regulatory tool to determine the forward-looking cost of providing telephone service, focusing particularly on two existing models: 1) the Benchmark Cost Model ("BCM2") developed under the auspices of U S WEST and Sprint Corporation ("Sprint") as a device for determining universal service costs; and 2) the Hatfield Model ("Hatfield") developed for AT&T Corp. ("AT&T") and MCI Telecommunications Corporation ("MCI"). The Notice requests comment on the criteria which should guide evaluation of any computer proxy cost model, the use(s) to which such a model should be put, and the extent to which the BCM2 or Hatfield meets any appropriate evaluation criteria.

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[1] Public Notice, Commission Staff Releases Analysis of Forward-Looking Economic Cost Proxy Models, DA 97-56, rel. Jan. 9, 1997 ("Notice"); and see Public Notice, Further Extension of Time Granted for Parties to Submit Comments In Response To Commission Staff's Analysis Of Cost Proxy Models, CCB/CPD No. 97-2, DA 97-333, rel. Feb. 12, 1997.

As one of the developers of the BCM2, U S WEST finds itself in a position in which it feels it can help the Commission develop, choose and refine forward-looking cost models. Indeed, U S WEST has been involved in seeking to obtain a broader industry agreement on proxy cost models, and the involvement of Sprint in the development of the BCM2 (in addition to MCI's involvement in the earlier versions of the BCM) reflects what we perceive as U S WEST's commitment to cost models based on reasonable and accurate costing and engineering principles. And this really is the key to analysis of any computer proxy cost model -- that it accurately determine costs based on principles which are neutral and as universal as the specialized telecommunications industry will permit.

In this context, the latest version of BCM2, the Benchmark Cost Proxy Model ("BCPM"), which incorporated many of the principles utilized in the Pacific Telesis CPM, was submitted to the Commission on January 31, 1997.[2] This was a date agreed on for submissions by U S WEST and AT&T/MCI of updates to the respective models. U S WEST received the revised Hatfield on February 7, a week later. (Hatfield's sponsors had claimed that the revised Hatfield Model would make more than two hundred changes to the earlier versions which AT&T and MCI had been using to justify various pricing demands.) We have simply not had sufficient time to review and analyze the new Hatfield Model, which appears to replicate many of the fundamental mistakes which have made it useless as a cost evaluation tool in the past. These comments will therefore perforce focus on the criteria for

[2] Attached as Attachment A is a chart comparing BCPM with the criteria for cost models suggested by the Staff Analysis and the Universal Service Joint Board.

evaluation set forth in the Staff Report, and discuss how the BCPM meets those criteria. Several critical observations about Hatfield are made herein, and documents analyzing the older versions of Hatfield are submitted. However, it is simply not possible to evaluate the new Hatfield version within the time frame allowed by AT&T and MCI.

I. HATFIELD CANNOT PASS THE FUNDAMENTAL TEST OF NEUTRALITY

It is fundamental that any computer proxy cost model, in order to be even remotely accurate or tangentially useful, must be designed to determine costs accurately, not to prove a predetermined point. And this is really the most fundamental weakness of Hatfield -- it was designed to prove that the prices for access and unbundled network elements which its sponsors desire to purchase should be as low as possible. In this context, even assuming that Hatfield was otherwise assembled in good faith, when a model deviates from the neutrality principle, each of the numerous decisions which go into devising a computer proxy cost model will necessarily be biased toward cost reduction, rather than cost determination. The Hatfield was simply not developed on a basis which was intended to permit neutral application to derive telecommunications costs -- it was developed for the purpose of reducing AT&T's and MCI's prices for incumbent local exchange carrier ("ILEC") services.

Several manifestations of this fundamental bias in Hatfield are now apparent. Suspicions as to Hatfield's neutrality go back nearly a year, beginning

with AT&T's obsessive secrecy about permitting the Model to be examined.[3] These suspicions deepened when Hatfield came up with a loop cost bracketed between $502 and $740, while AT&T itself was alleging elsewhere that forward-looking loop costs were properly set at $1,250.[4] In other words, AT&T, when it suited its interests, alleged that Hatfield understated loop costs by approximately 50% (a number which comports with most other studies).

In this context, it has occurred to most industry participants that a reasonable test of the essential neutrality (or lack thereof) of Hatfield would be to see what prices/costs Hatfield would predict for AT&T and MCI. After all, AT&T and MCI have contended with great vigor that Hatfield documented both forward-looking costs and what the price of telecommunications service would be in a competitive marketplace.[5] AT&T and MCI have also been vigorous in contending that the interexchange marketplace in which they operate is fully competitive. Accordingly, if Hatfield is at all a reasonable model for calculating forward-looking costs of providing telecommunications services, it ought to properly predict AT&T's and MCI's costs as well. And if AT&T and MCI's arguments are to be believed,

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[3] U S WEST's extreme difficulties in its attempts to examine Hatfield are detailed in U S WEST's Petition for Order Directing That Discovery Be Permitted, filed June 13, 1996; Reply To Comments On Its Petition For Order Directing That Discovery Be Permitted, filed June 25, 1996; and Supplement To Petition For Order Directing That Discovery Be Permitted, filed July 10, 1996. Copies of these filings are attached hereto as Attachment B.

[4] See U S WEST's Comments on Cost Proxy Models, filed Aug. 9, 1996 at 7 n.14.

[5] As we discuss below, in a competitive market, forward-looking costs do not represent a price ceiling.

their own prices ought to be capped by the forward-looking costs developed in a manner consistent with Hatfield.

Not surprisingly, AT&T and MCI have been absolutely intransigent in their refusal to permit such an analysis to be conducted. However, several new admissions by AT&T permit sufficient analysis to warrant drawing at least the preliminary conclusion that application of Hatfield to AT&T's own costs would result in costs less than half of what AT&T alleges are its own costs calculated pursuant to the Commission's Total Element Long Run Incremental Cost ("TELRIC") methodology. This analysis, sketchy as it is, clearly warrants a detailed examination of how Hatfield would predict AT&T's costs and prices versus how AT&T itself calculates them. In the absence of such analysis, Hatfield must be discarded. If, as we allege, Hatfield predicts costs and prices for AT&T which are far below AT&T's own TELRIC and AT&T's own prices, Hatfield must likewise be discarded.

As is noted in the attached affidavit of Glenn H. Brown, AT&T is proclaiming that its TELRIC for long distance service is approximately 1.5 cents per minute.[6] This is consistent with AT&T's public pronouncements in other fora.[7] Based on an analyses of TELRIC for U S WEST switching and transport interpolated to analyze transport at 1,000, miles, it appears that Hatfield would reduce AT&T's TELRIC for

[6] See Attachment C.

[7] See BellSouth Corp. Awards AT&T Contract, Wall Street Journal, June 20, 1996 at D6.

long distance to .210 cent, or approximately 15% of what AT&T claims. These calculations are derived as follows:

	U S WEST TELRIC	Hatfield 3.0	AT&T TELRIC[1]
Originating Switching[2]	.200	.074	
Transport	.736[3]	.062[4]	
Terminating Switching[2]	.200	.074	
TOTAL	1.136	.210	1.5

Note (1): AT&T claims their long distance wholesale rates are based on TELRIC. Individual components have not been identified
Note (2): Based on tandem switching cost produced by model
Note (3): U S WEST TELRIC for common transport assuming average carrying distance of 1,000 miles
Note (4): Hatfield common transport -- no charge for mileage identified

AT&T is clearly in a box here. If its prices are as far above Hatfield as evidence indicates, either AT&T must be held to possess significant market power or Hatfield is invalid. The fact that Hatfield produces costs for AT&T which are not only far below AT&T's prices but well below AT&T's own TELRIC costs as well simply demonstrates, in the context of this proceeding, that Hatfield is really not a valid cost proxy model. If AT&T and MCI are to continue to advocate the use of Hatfield for any purpose, they must permit detailed analysis of the impact of Hatfield on their own costs and prices.

II. THE PROPER USE OF COST PROXY MODELS

One key area addressed by the Notice and the Staff Analysis is the use to which a valid cost proxy model should be put. A valid cost proxy model will determine forward-looking economic costs of providing service. These costs are particularly appropriate in determining universal service support -- the basis for development of the BCM. They may also be useful in examining the reasonableness

of a carrier's prices -- prices which deviate wildly from economic costs might be indicative of market power or, if market power is already present, unreasonable rates. Proxy cost models should not be used to set carrier prices because they do not really show actual carrier costs. As a general principle, proxy cost models should be used for determining costs -- and such costs should be evaluated in proper context.

Multipurpose models are by necessity more complex than models designed for a single purpose. In addition, multiple objectives can make a model less suitable for meeting any one of the objectives for which it is designed. For instance, a universal service fund (or "USF") model could be designed for the dual purpose of providing affordable voice grade telephone service to all customers while minimizing the required contributions to the USF. In this instance, the network design would not require the conditioning and electronics required for higher-end services such as Integrated Services Digital Network ("ISDN"). By minimizing the requirements of the network, costs could be reduced. A model designed to cost unbundled network elements must include a network design sufficient to provide all functions that are unbundled. For instance, the distribution plant must be designed with the capacity to provide ISDN if it is an unbundled element. In such an instance the cost of the network increases as the capacity requirements increase. Fox example, a model such as Hatfield 3.0[8] that uses long heavy-gauge copper loops without signal enhancing electronics, could not be used to price unbundled services that include ISDN since the denigration of the signal inherent in the design would preclude

[8] When we refer to the new Hatfield model rather than the generic Hatfield series, we use the designation "Hatfield 3.0."

providing the service. There is a direct correlation between the requirements of the network and the cost derived by modeling the requirements.

Additionally, it would not make sense to base the cost of unbundled network elements on a model that was different than the model used to cost a company's retail services. At this time none of the proxy models filed in this docket produces separate costs for basic business, residence and coin services, let alone the hundreds of other products LECs are required to cost, such as special access. Despite repeated requests for these cost results, the authors of Hatfield have failed to cost a single retail service. It is impossible to base the cost of unbundled elements on models that were not designed to price the retail counterparts. Again, revising the models to perform these tasks would add significant complexity to the design.

However, should the Commission desire the complexity of a single model for USF, access reform and the proxy pricing of unbundled elements the BCPM would be the only logical choice. The BCPM could be more easily refined to perform these functions. In their efforts to minimize costs, the developers of the Hatfield have used a network design that limits the ability of the distribution network to provide the Asymmetric Digital Subscriber Line ("ADSL"), High bit-rate Digital Subscriber Line ("HDSL") and ISDN services which are required by the Commission's Interconnection Order.[9] In addition, the originators' insistence on write protecting

[9] In the Matter of Implementation of the Local Competition Provisions in the Telecommunications Act of 1996; Interconnection between Local Exchange Carriers and Commercial Mobile Radio Service Providers, CC Docket Nos. 96-98 and 95-185, First Report and Order, FCC 96-325, rel. Aug. 8, 1996 ("Interconnection Order"), appeals pending sub nom. Iowa Utilities Board v. FCC, Nos. 96-3321, et al. (8th Circuit).

the calculations and algorithms in the model precludes any joint effort to revise the model to provide the capacity to offer these elements. The BCPM would require fewer modifications, since the basic network design would allow for the provision of all network elements. In addition, the fact that all parties have access to the basic model design would facilitate verifying and auditing any changes made to the model.

However, we are very concerned that the assumption not be made that the economic costs of providing service ought to be some kind of price ceiling or otherwise form the sole basis on which to evaluate regulated prices -- be they interconnection prices or access prices. As no competitor would invest in new technology or service based on the expectation that its return would be limited to the economic forward-looking costs of service, regulatory pricing based solely on such costs would be uneconomical and detrimental to the development of new infrastructure as well as the maintenance of existing infrastructure and contrary to the public interest.

In a competitive environment all competitors continually strive to achieve the lowest cost structure to attain a cost advantage over each other. These competitive market forces tend to drive prices in the direction of economic costs. However, forward-looking costs would be reflected as the price only if all competitors achieve the same forward-looking costs and no competitor had any competitive advantage at all. In an actual competitive market (not hypothetical or theoretical), competitors who achieve a cost advantage over the others will price higher than forward-looking costs to realize higher profits. New investment is made to achieve a competitive

advantage, which in turn permits the competitor to achieve a return on the investment in excess of economic cost.

For this reason, forward-looking costs should not be used as a price ceiling or as the only service price. A competitive market would not create such a result. This is especially so in the telecommunications industry where long-term investments of more than 20 years are required. As a result, costs transition to forward-looking costs over longer periods of time. An ILEC's, or a competitive LEC's ("CLEC"), for that matter, cost will always consist of a mix of old and new technology. The high levels of investment required will economically constrain investors from quickly retiring their embedded investment and replacing it with the best forward-looking technology.

Examples of this phenomenon are the cellular and cable industries. Both of these industries are responding to new competitive threats (PCS and satellite) but the response is tailored to the areas of greatest competition and the roll-out of new technology will occur over several years. Even the long distance industry did not move to full fiber digital networks until years after divestiture, and some networks still utilize some analog technology. Similarly, if this Commission determines that prices should be set at forward-looking costs of plant, assuming a continuous, instantaneous rebuild of the network, the depreciation lives in the models must reflect this assumption. The models today assume cable facilities last in excess of twenty years. TELRIC models assume plant is immediately upgraded to reflect the least-cost forward-looking technology under an optimal total network layout. These two assumptions are completely contradictory. You can't replace the network

instantaneously year after year and assure it will last 10 to 20 years. Switch prices change every few years. TELRIC would reflect these changes while continuing to assume that the switches will last 10 years. Feeder facilities need to be reinforced approximately every five years. TELRIC studies ignore these reinforcement costs, assuming optimal feeder layout while spreading the cost of that layout over 20 years. If TELRIC is to be the sole basis for pricing, then depreciation lives must be revised to reflect continuous upgrades.

U S WEST continues to support pricing based on a firm's actual (not hypothetical or theoretical) cost during the transition to competition and price deregulation. Forward-looking costs (such as TELRIC and Total Service Long Run Incremental Cost ("TSLRIC")) can represent a starting point for analysis, but cannot substitute for a carrier's actual costs.

III. CRITERIA FOR EXALUATING PROXY COST MODELS

The Notice and the Staff Analysis set forth a variety of possible criteria for evaluating computer proxy cost models. In this section, U S WEST comments on those criteria.

A. Ability To Independently Verify Model Results

Independent verification is critical to ascertaining the accuracy of any model. Seemingly reasonable costing principles, methods and inputs can lead to significantly flawed results if they are never verified. U S WEST's method of verifying Hatfield by applying its methodology to AT&T's costs and its self-proclaimed TELRIC is discussed above. Only when model outputs are compared to real-world experience can a model be verified. AT&T and MCI have shown a

reluctance to seek independent verification of their model results. Attempts to solicit the data necessary to compare their actually incurred costs to results produced by models they sponsor have been repeatedly rebuffed by claims of confidentiality or relevancy. Attempts to verify costs with U S WEST's actual experience have been derided due to claims of monopoly inefficiencies. A data-free environment allows for optimal manipulation.

Conversely, U S WEST welcomes any attempts at independent verification of either the BCPM or its TELRIC models. The BCPM was not developed to reach a predetermined result, and independent verification will confirm this fact. We applaud the Commission's desire to seek a verifiable answer to the cost question. U S WEST has continuously sought to verify its costing procedures with historic construction costs, the current cost of deploying new loops, comparisons of model network designs to current network layouts, and competitive bids for new loops. Although none of these methods directly mimics network design in a TELRIC model, they provide some evidence as to the reasonableness of the model output. Data from other facilities-based providers such as cable operators and LECs could further corroborate the model outputs. In this instance, it would be important to ensure that the networks being compared have similar distance and density characteristics and design specifications. Again, any evidence is better than no evidence.

One method of verification which U S WEST has found productive is use of the bid process to determine what the marketplace would charge to construct telecommunications facilities. As competitors who construct facilities on behalf of

U S WEST presumably price their service at market-based rates, their prices should reflect the reasonable costs which U S WEST should use as inputs for its own services and facilities.

U S WEST has used the bid process to seek corroborative evidence for its model outputs. This process provides some useful information, but also has certain limitations. Contractors do not respond to bid requests that are unlikely to be awarded. Those projects that meet this classification are generally large growth jobs. The information obtained from this process, at least through our experience, is not directly applicable to building a network throughout one representative area. In light of this shortcoming of the bid process, U S WEST would recommend that the Commission select several engineering firms to design a network to serve a given area such as a Census Block Group ("CBG"). The specifications for the network would need to be identified up front and the firms design the job as though it will be constructed. Such a study would provide results directly comparable to a TELRIC methodology. U S WEST would be happy to participate in the cost and design of such a study.

In the absence of the above study, the Commission should use any and all data available to measure and evaluate the reasonableness of the model outputs. Historic costs, competitive bids, annual construction expenditures, independent engineering evaluation of the models, and construction costs incurred by ILECs and cable operators would provide some basis for determining the reasonableness of the model inputs and results. Without including all available data, a model could be

constructed to validate a pre-existing conclusion (the Hatfield is precisely such a results-driven model) rather than to evaluate information.

B. Proprietary Models And Proprietary Inputs

The proprietary issues must be addressed on two fronts, those related to the model itself and those related to the model inputs. All models should be open and available for independent evaluation. Users must have the ability to revise inputs and algorithms in order to evaluate the sensitivity to various assumptions and conceptual changes. Models, such as Hatfield, that are write protected are difficult, if not impossible, to evaluate. Sensitivities to changes in network design cannot be run because the algorithms are write protected and cannot be revised. The audit functions which allow users to trace data from one section of the model to another do not operate in a write-protected environment. Only originators can make revisions to the model, thus limiting and delaying attempts for model improvements. No model is perfect. All models must be revisable as new information or applications are identified. A write-protected model places all the power and ability in the hands of the model originators, leaving other users at a significant disadvantage in promoting or presenting their concerns. The Commission should insist that any model it adopts be open for public evaluation and be revisable by all parties based on new model requirements or additional information.

The selection of a proxy model should not be premised on whether it is currently using proprietary or publicly available inputs. The BCPM and Hatfield can be populated with any inputs, proprietary or not, a user specifies. The

applicability of the design should be the predominate factor in selecting a model. A Commission decision to rely on proprietary information in determining model inputs can be made with no regard to the actual model being selected.

U S WEST believes that the use of proprietary information in determining inputs improves the reliability of model outputs. It is the very nature of proprietary information that makes it valuable in these deliberations. Information is determined to be proprietary if it is valuable to the business and if the open release of the information could harm the originator by providing competitors access to competitively sensitive information.[10] In other words, information is deemed proprietary only if it is valuable. The inputs in Hatfield 2.2 are to a large extent based solely on the opinion of an ex-NYNEX engineer. No data has been provided to substantiate his estimates. These estimates are impossible to confirm or refute absent evidence on actual expenditures. Generally, that evidence is proprietary. Valuable and confirming information should not be ignored solely because it is proprietary. Regulators have recognized the fact that access to proprietary information is critical to performing their functions and therefore have set up procedures to protect that information so that it can be introduced in regulatory proceedings. Costing decisions would be based on real market data. Real market data is generally proprietary. Absent this data, regulators are relegated to the role of relying on educated guesses by various subject matter experts.

[10] See 47 CFR § 0.457(d).

C. A Computer Model Must Be Sufficiently Flexible To Permit Modifications Of Assumptions And Inputs

The model should include the capability to examine and modify the critical assumptions and engineering principles. Any model utilized for multiple purposes must contend with the trade-off between flexibility and complexity. If a model is designed to allow an infinite number of model assumptions to change, the operation of the model would become infinitely complex. Therefore, the BCPM is designed to provide users with flexibility to change major engineering assumptions, such as the copper/fiber breakpoint, but not to change the basic architecture used in the model. Listed below are a number of areas where the BCPM provides the user flexibility:

- BCPM allows the user to access and vary all inputs in the program through either easy-to-use-drop-down menus or direct access to the EXCEL spreadsheets.
- BCPM provides an integrated module to develop structure costs for aerial, buried and underground installations by density group and terrain difficulty. This allows the user to individually vary the cost of installation activities (e.g., plowing, trenching, conduit, etc.) as well as the percentage of construction activity by density zone. Additionally, the user can vary the percentage of an activity which can be shared among utilities, such as the placing of poles.
- BCPM provides methods to process multiple investment and expense views across multiple states. This provides the user with a great deal of flexibility in performing multiple scenario analysis. This flexibility

extends to producing results by CBG, wire center, operating company, state, or parent company.

- BCPM uses a simple yet powerful module to develop capital costs. The user is able to specify values for costs of debt and equity, debt/equity ratios, as well as depreciation and tax rates. The model uses the financial methodologies that an efficient new entrant would use, such as deferred taxes, mid-year, beginning-year and end-year placing conventions, Gompertzmakeham survivor curves, future net salvage, and equal life group methods.
- BCPM develops separate depreciation rates and annual charge factors for each of the USOAR Main Accounts.
- BCPM allows full use of the EXCEL audit function and full access to the model logic. The BCPM sponsors assert their rights under copyright law to maintain the integrity of the model but will work with parties who desire to perform alternative analyses with the model. Any party modifying the BCPM logic should fully document and provide engineering justification for their changes in order for other parties to assess the impacts.

In contrast, Hatfield is quite rigid and does not permit this type of flexibility.

IV. MODEL STRUCTURE AND INPUT REQUIREMENTS

A. Underlying Structure Of Models

The Staff Report addresses the underlying structure of computer proxy cost models and the types of input necessary to permit identification of valid cost data.

1. Existing Wire Center Approach

U S WEST agrees with the Staff Analysis that existing wire center locations and boundaries form the best basis for the current proxy models' cost estimates. At present, the cost of providing universal service can be based only on current central office locations because the current network switch nodes were designed explicitly to provide voice-grade service ubiquitously throughout the nation in the most cost-effective manner. The cost of moving the wire center would be considerable in itself.

In the future, the existing boundaries will likely continue to provide the least-cost network when considering universal service applications where the network is designed to provide connectivity to all residences and businesses. It is only when other networks and technologies are available and ubiquitously deployed, eliminating the need for regulatory pricing constraints, that these architectures and configurations can be adopted into the cost models. At the time when alternative networks are available ubiquitously, federal universal service support will need to be reassessed to determine if certain geographic areas continue to require federal support to maintain network connectivity. At that time there will not need to be any provider-of-last-resort requirements, since customers will have options.

2. Geographic Unit Of Analysis

The BCPM currently uses CBGs as the geographical unit of analysis. In future phase releases of BCPM, it is possible to use a combination of CBGs, census blocks, and aggregated census block data to identify customer locations. The census

block is the smallest geographic unit for which household data is collected, therefore moving to smaller geographic units involves allocations of customer data and resulting inaccuracies.

3. Specification Of Demand

U S WEST agrees with the Staff Analysis that a reliable estimate of customer demand patterns is necessary to accurately estimate the cost of serving a CBG. However, U S WEST does not maintain geocoded information of its customer base by CBG. Additionally, U S WEST is unaware of any other LEC that maintains such data. Given these facts, the BCPM developers have relied on a combination of Census Bureau data for households and Dun and Bradstreet business data as the most accurate data available to develop the modeling process. While this data provides sufficient accuracy for planning purposes, the administration of a USF demands a higher level of data specificity. Ultimately, the most accurate method to determine access lines by CBG is to have the USF administrator conduct a study which codes the actual CBG location of access lines for both business and residential customers. This level of detail is necessary for the fund administrator to determine the total size of the fund, as well as to validate fund amounts distributed to carriers in high cost areas.

B. Modeling Of Network Investments

1. Loop Plant

BCPM designs a voice-grade network using state-of-the-art technology that is currently available for deployment. The BCPM's default values and parameters provide a network capable of providing basic single-party voice-grade service that

allows customers to utilize currently available data modems for dial-up access. The BCPM designs the network to eliminate problems associated with providing voice-grade service over loaded loop plant.

To provide adequate transmission capabilities for fax and dial-up modems, BCPM sets maximum loop lengths for copper at 12,000 feet for both feeder and distribution which eliminates problems arising from loading and resistance. In addition to the 12,000 foot copper-to-fiber breakpoint, the BCPM uses 26-gauge in the feeder and 26/24 gauge in the distribution. Twelve thousand feet of 26 gauge copper has a resistance value of 999.6 ohms (83.3 ohms per thousand feet @ 68 degree Fahrenheit, well within the 1500-ohm supervisory limit of today's digital switches. The 26/24 gauging used in the distribution takes into account the 900 ohm powering limitations of DLC line cards, without going to the considerably more expensive extended range line cards.

The 12,000 foot breakpoint, along with a loop network design that avoids bridged-tap, also removes acceptance concerns. Avoiding bridged-tap is accomplished by tapering and placing feeder-distribution interfaces ("FDI"). The 12,000 foot breakpoint also facilitates the provision of services up to DS1. Additionally, the BCPM uses digital loop carrier systems for voice-grade services rather than analog copper facilities when demand within a CBG exceeds the capacity of copper cables.

Cable fills that are found in the BCPM tables allow for proper network design. These cable fills allow maintenance operations to cost effectively deal with defective pairs and administer customer turnover. The default values take into

account that a new network is constructed to serve existing households (a snapshot view) with limited excess capacity for growth.

The costs of network equipment (cables, electronics, and switching) are developed using large LEC data for today's discounted equipment cost. Placing costs for structure are also based on large LECs' current cost for placing facilities by density group and terrain difficulty.

The BCPM investment module develops investments for the feeder and distribution portions of the local loop and identifies specifically underground, buried, and aerial investments by metallic and non-metallic plant. Additionally, the BCPM identifies the investments in conduit and pole accounts, so that each plant account can utilize its specific depreciation life in the development of depreciation expenses and capital costs. Other investment accounts are also quantified individually.

The BCPM provides an integrated module to develop structure costs for aerial, buried, and underground installations by density group and terrain difficulty. This allows the user to individually vary costs of installation activities, such as plowing, as well as vary the percentage of a construction activity by density zone. Additionally, the user can vary the amount of an activity that can be shared between utilities, such as the placing of poles.

The sponsors of BCPM have provided full documentation with the model in its January 31, 1997 filing.

2. Loop Plant Fill Factors

Fill factors represent the fraction of installed outside plant that is actually in use. This standby capacity is necessary to provide for growth and breakage without installing additional capacity. All models make assumptions regarding appropriate feeder and distribution fill factors in estimating the amount of plant to be provided to serve a given number of loops. Since the choice of fill factor affects directly the amount of plant required to deliver a loop, it has a significant effect on the total cost of providing those services. The most important aspect of fill factors in a cost model, is the reality that one cannot choose a fill factor independently of other costs. The amount of standby capacity designed into a network is the result of an economic cost optimization process.[11] High levels of standby capacity result in higher initial capital costs, but lower costs for periodic reinforcement rearrangement and a decreased probability of service deficiencies. Low levels of standby capacity reduce the initial capital cost of loops, but increase the required frequency of reinforcement and rearrangement and result in a higher probability that service cannot be provided in a timely manner. A well-designed network will have an optimal amount of standby capacity, balancing the cost of providing that capacity against the adverse effects of low levels of fill on operating costs and service quality. Cost models provide easy "adjustment" of fill factors and accurately model the effect of those adjustments on the cost of providing standby capacity. Increasing fill factors, and thus reducing the level of standby capacity in the network, results in a lower estimated loop cost. It is crucial to understand that this

[11] See Attachment D for an economic evaluation of the optimization problem.